PARTIAL TRANSLATION OF JAPANESE UNEXAMINED PATENT PUBLICATION (KOKAI) No. 2002-336653

Title of the Invention: Plasma catalytic reactor, and Apparatuses of cleaning air, nitrogen oxide, and exhaust combustion gas, and Apparatuses of decomposing dioxin, and Freon gas
Application No.: 2001-150586
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[Claims]
[Claim 1]

A plasma catalyst reactor, comprising a discharging means (21, 22) for generating a low-temperature plasma by a discharge in a flowing space of a fluid to be treated, and a catalyst means (23) located in or downstream of a discharging field (D) in said discharging means (21, 22), characterized in that said catalyst means (23) contains, as a catalytic substance, a mixture of a manganese and at least one oxide selected from iron, cerium, europium, lanthanum, and copper, or a composite mixture.

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[0037]
[Embodiment 1 carrying out the present invention]

The embodiments of the present invention will be described, referring to the drawings:

[0038]

This embodiment relates to an apparatus (1) for cleaning air by an oxidative decomposition treatment of odor or harmful components in air to be treated. Fig. 1 schematically illustrates the apparatus (1) for cleaning air.

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[0042]

Fig. 2 is a schematic cross-sectional view of a plasma reactor (20), and Fig. 3 is a perspective view thereof. The plasma reactor (20) contains a discharge electrode (21) and a counter electrode (22) as a discharging means for generating a low-temperature plasma, and a treating member (23) located between the electrodes (21, 22) and adjacent to the counter electrode (22). That is, the treating member (23) is arranged

in the discharging field (D).

[0043]

The treating member (23) is formed by a substrate (23a) having a honeycomb structure and containing a lot of fine pores passing through in the direction of air stream. Catalyst substances are carried on the surface of the treating member (23).

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[0048]

The electrodes (21, 22) are connected to a direct-current high voltage power supply (current source means) (24), whereby a streamer discharge is generated. The streamer discharge generates a gas as a low-temperature plasma in the discharging field (D). The gas contains, as active species, high energy electron, ion, ozone, radical such as hydroxyl radical, and other exciting molecules, such as exciting oxygen atom, exciting nitrogen atom, exciting water atom, or the like.

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[0094]

(Modified Embodiment 4)

In a modified embodiment 4 of the Embodiment 3, a partial discharge is employed as a discharging method in the plasma catalyst reactor (20). In this embodiment, a structure of the discharging means (21, 22) will be described, referring to Fig. 10.

[0095]

In the plasma catalyst reactor (20), the discharge electrode is a liner electrode, and the counter electrode (22) is a cylindrical electrode arranged around the liner electrode in the center. The electrodes (21, 22) are connected to a high voltage power supply (now shown) applying a high frequency alternating-current voltage or a high frequency pulsed voltage. In this embodiment, the discharging field (D) is formed in the cylindrical counter electrode (22). The discharge electrode (21) may be a cylindrical or rod-like electrode thicker than the liner electrode as shown in figure.

[0096]

The catalyst particles (23) containing the catalytic substances (manganese oxide, and the specific oxides such as iron oxide or cerium oxide) which are the characteristic feature of the present invention are filled in the counter electrode (22). That is, the catalyst particles (23) are placed in the discharging

field (D), and the plasma catalyst reactor (20) has a structure of, a so-called packed-bed reactor. The catalyst particle (23) carries the above catalytic substance on the surface of a particle of a ferrodielectric substance, such as barium titanate.

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[Brief Explanation of Drawings]

[Fig. 1]

A view showing a structure of air-cleaning apparatus equipped with a plasma catalytic reactor according to the embodiment 1 of the present invention.

[Fig. 2]

A schematic sectional view showing the structure of the plasma catalytic reactor in the air-cleaning apparatus of Fig. 1, and a discharging system (a streamer discharge).

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[Fig. 10]

A schematic sectional view showing a discharging system (a partial discharge) of the plasma catalytic reactor according to the fourth modification of the embodiment 3.

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[Explanation of Reference Numbers]

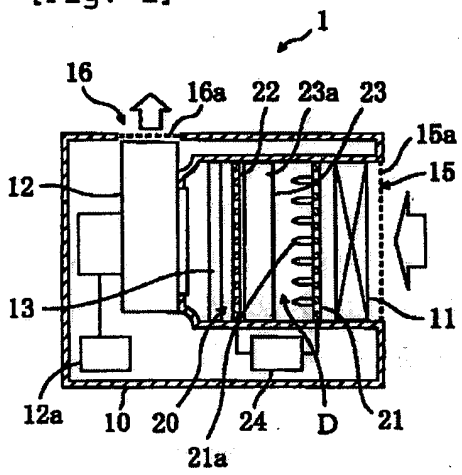
(1) An apparatus of cleaning air;
(2) An apparatus of cleaning nitrogen oxide;
(3) An apparatus of cleaning exhaust combustion gas;
(4) An apparatus of decomposing dioxin;
(5) An apparatus of decomposing Freon gas;
(10) casing;
(11) dust collection filter;
(12) centrifugal fan;
(15) air inlet (opening for introducing gas);
(16) air outlet (opening for ejecting gas);
(20) plasma catalyst reactor;
(21) discharge electrode;
(22) counter electrode;
(23) treating member (catalyst means, adsorbing means);
(24) high voltage power supply.

[Translator's supplement]

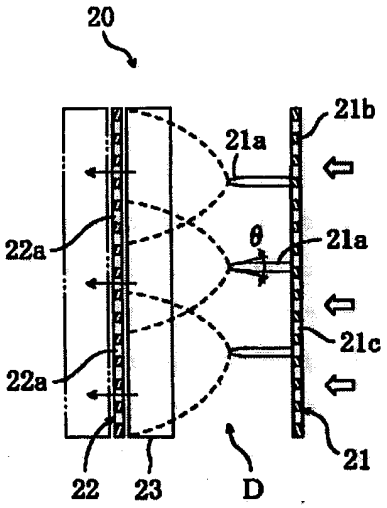
(12a) power supply for fan

(13) ozone decomposing catalyst;
(21a) needle electrode
(21b) electrode plate
(21c) opening for passing air
(22a) opening for passing air
(23a) substrate
(23b) pass-through fine pore

[Drawings]
[Fig. 1]



[Fig. 2]



[Fig. 10]